# PROCESS AND COMPOSITION TO ENHANCE REMOVAL OF POLYMER-CONTAINING FILTER CAKES FROM WELLBORES

The use of fluids for conducting various operations in the boreholes of subterranean oil and gas wells which contact a producing formation are well known. Thus drill-in fluids are utilized when initially drilling into producing formations. Completion fluids are utilized when conducting various completion operations in the producing formations. Workover fluids are utilized when conducting workover operations of previously completed wells.

One of the most important functions of these fluids is to seal off the face of the wellbore so that the fluid is not lost to the formation. Ideally this is accomplished by depositing a filter cake of the solids in the fluid over the surface of the borehole without any loss of solids to the formation. In other words, the solids in the fluid bridge over the formation pores rather than permanently plugging the pores.

Many clay-free fluids have been proposed for contacting the producing zone of oil and gas wells. See for example the following U.S. patent: Jackson et al. U.S. Pat. No. 3,785,438; Alexander U.S. Pat. No. 3,872,018; Fischer et al. U.S. Pat. No. 3,882,029; Walker U.S. Pat. No. 3,956,141; Smithey U.S. Pat. No. 3,986,964; Jackson et al. U.S. Pat. No. 4,003,838; Mondshine U.S. Pat. No. 4,175,042; Mondshine U.S. Pat. No. 4,186,803; Mondshine U.S. Pat. No. 4,369,843; Mondshine U.S. Pat. No. 4,620,596; and Dobson, Jr. et al. U.S. Pat. No. 4,822,500.

These fluids generally contain polymeric viscosifiers such as certain polysaccharides or polysaccharide derivatives, polymeric fluid loss control additives such as lignosulfonates, polysaccharides or polysaccharide derivatives, and bridging solids.

After the wellbore fluid has completed its desired function, it is desirable to remove the filter cake before placing the well on production. When the bridging agent in the wellbore fluid is acid soluble, this is generally accomplished by displacing the wellbore fluid with a strongly acidic solution and allowing the acidic solution to contact the filter cake for a period of time which is sufficient to solubilize the bridging particles. These strongly acidic solutions require specialized equipment for their safe handling since they are extremely corrosive to equipment and on personal contact. When the bridging agent is water soluble, the wellbore fluid is displaced with a shale-inhibitive aqueous fluid which is undersaturated with respect to the water soluble bridging particles. This undersaturated fluid requires a long contact time to accomplish the solubilization of the water soluble bridging particles due to the encapsulating effect of the polysaccharide polymer or polymers present in the filter cake.

Processes are known in the art for removing polymeric materials from a porous media such as a subterranean formation. See for example the following U.S. patents: Hanlon et al. U.S. Pat. No. 4,609,475; Brost U.S. Pat. No. 4,846,981; McGlathery U.S. Pat. No. 4,871,022.

Thus there is a need for a process of removing the filter cake from the sides of a borehole penetrating a hydrocarbon-bearing subterranean formation which will be effective over a broad temperature range in relatively short periods of time, and which will be easy and safe to use.

It is an object of this invention to provide a process for the removal of a polymer-containing filter cake from the sides of a borehole in a hydrocarbon-containing subterranean formation which is effective, safe and which requires no special equipment.

## SUMMARY OF THE INVENTION

The present invention provides a process for the removal of filter cakes containing one or more polysaccharide polymers and bridging particles from the sides of a borehole in a hydrocarbon-containing formation. The process comprises contacting the filter cake with a brine fluid comprising a peroxide selected from the group consisting of alkaline earth metal peroxides, zinc peroxide, and mixtures thereof, an aqueous brine, and an acidic substance to provide the soak solution with a pH in the range from about 1 to about 8, and, optionally, an activator for the peroxide for a period of time at least sufficient to decompose the polysaccharide polymers therein and to at least partially dissolve the bridging particles therein such that the filter cake is removed from the formation, and thereafter circulating said peroxide-containing fluid out of said borehole.

Preferably, the process comprises (1) contacting the filter cake with a soak solution comprising a peroxide selected from the group consisting of alkaline earth metal peroxides, zinc peroxide, and mixtures thereof, an aqueous liquid, and an acidic substance to provide the soak solution with a pH in the range from about 1 to about 8, and, optionally, an activator for the peroxide, for a period of time at least sufficient to decompose the polysaccharide polymers therein to such an extent that the filter cake forms a loosely adherent mass on the sides of the borehole, and (2) thereafter contacting the sides of the borehole with a wash solution to remove the remaining filter cake solids therefrom, wherein the soak solution has no appreciable solubilizing effect on the bridging particles, and wherein the bridging particles are soluble in the wash solution.

In a preferred embodiment wherein the bridging particles within the filter cake are water soluble, the aqueous liquid in the soak solution is an aqueous liquid in which the water soluble bridging particles are not soluble, preferably an aqueous liquid which is saturated with respect to the water soluble bridging material, and the wash solution comprises an aqueous liquid in which the water soluble bridging particles are soluble, hence which is unsaturated with respect to the water soluble bridging material.

In another preferred embodiment, the invention provides a composition for decomposing polysaccharide polymers contained within filter cakes on the sides of a borehole which comprise an aqueous liquid in which the bridging particles present in the filter cake are not appreciably soluble, a peroxide selected from the group consisting of alkaline earth metal peroxides, zinc peroxide, and mixtures thereof, an activator for the peroxide, and an acid substance to provide the composition with a pH in the range from about 1 to about 8.

While the invention is susceptible of various modifications and alternative forms, specific embodiments thereof will hereinafter be described in detail and shown by way of example. It should be understood, however, that it is not intended to limit the invention to the particular forms disclosed, but, on the contrary, the invention is to cover all modifications and alternatives falling within the spirit and scope of the invention as expressed in the appended claims.